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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/820,856	04/09/2004	Min-Lung Huang	HUAN3261/EM	8686

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EXAMINER
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KALAM, ABUL

ART UNIT	PAPER NUMBER
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2814

MAIL DATE	DELIVERY MODE
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05/15/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	Application No. 10/820,856	Applicant(s) HUANG, MIN-LUNG	
	Examiner Abul Kalam	Art Unit 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 16 February 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1, 3, 4 and 7 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 3, 4 and 7 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. **Claims 1 and 4** are rejected under 35 U.S.C. 102(b) as being anticipated by **Mis et al. (US 5,767,010; previously cited, hereinafter, Mis)**.

With respect to **claim 1**, **Mis** teaches (**FIGS. 5 and 6**) an under bump metallization structure applicable to be disposed on bonding pads (**24**) of a semiconductor wafer, wherein a passivation layer (**26**) covers the wafer and exposes the bonding pads, the under bump metallization structure comprising:

an adhesive layer (**28**) formed on the bonding pads (**24**);  
a first barrier layer (**30**) disposed on the adhesive layer (**28**);  
a wetting layer (**32**) formed on the first barrier layer (**30**) (**col. 4: Ins. 11-27**); and  
a second barrier layer (**34'**) disposed on the wetting layer (**32**) (**col. 5: Ins. 58-67**), wherein a material of the second barrier comprises tin and copper and wherein the quantity of the copper is larger than that of tin (**Cu<sub>3</sub>Sn**) (**col. 5: Ins. 58-67**).

With respect to **claim 4**, **Mis** teaches the structure of claim 1, as set forth above, wherein the wetting layer (**32**) is a copper layer (**col. 4: Ins. 21-27; chromium-copper is a copper alloy, and thus is considered a copper layer**).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. **Claim 3** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Mis ('010)**, as applied to claim 1 above, and further in view of **Michael (US 5,563,102; previously cited)**.

With respect to **claim 3**, **Mis** teaches all the limitations of claim, as set forth above in claim 1, with the exception of disclosing: wherein the first barrier layer is a nickel-vanadium layer or a nickel layer.

However, **Mis** teaches that the first barrier layer (**30**) is formed of chromium (**col. 3: Ins. 11-27**), and **Michael** teaches that a barrier layer may formed of materials such as nickel-vanadium or chromium (**col. 9: Ins. 9-15**).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the structure of **Mis** with the teaching of **Michael**, to form the first barrier layer comprising nickel-vanadium, because it would have been considered a mere substitution of art recognized equivalent materials (MPEP 2144.06).

Substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. *In re Fount* 213 USPQ 532 (CCPA 1982); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); *Graver Tank & Mfg. Co. Inc. v. Lindle Air Products Co.* 85 USPQ 328 (USSC 1950).

3. **Claim 7** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Mis (‘010)** as applied to claim 1 above.

With respect to **claim 7**, **Mis** teaches all the limitations of the claim, as set forth in claim 1 above, with the exception of disclosing: wherein the thickness of the second barrier layer is ranged from about 50µm to 80µm.

However, it has been held that where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover optimum or workable ranges by routine experimentation. *In re Aller*, 220 F.2d 454, 105 USPQ 233, 234 (CCPA 1955). Furthermore, where patentability is aid to based upon particular chosen range or dimension recited in a claim, the Applicant must show that the chosen range or dimension is critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have a thickness of the second barrier layer in such a range as claimed, because the range is not critical since it can be optimized during routine experimentation, depending upon the conductivity desired for the second barrier layer.

### ***Response to Arguments***

Applicant's arguments filed on February 16, 2006 have been fully considered but they are not persuasive.

Applicant argues that the barrier layer **34'**, disclosed by **Mis (5,767,010)**, is not barrier layer, because the layer is not in place to prevent the reaction of solder material

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with the lower layer of the UBM. This argument is not persuasive because **Mis** teaches a second barrier layer of **Cu<sub>3</sub>Sn**, as defined by the claim, and the functional limitation, of the barrier layer preventing the reaction of solder material with the lower layer of the UBM, is not recited in the rejected claim. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Also, note that the Cu<sub>3</sub>Sn layer (**34' in FIG. 6**) of **Mis** is formed during the reflow process when the solder is heated (**col. 5: Ins. 41-67**), and thus the Cu<sub>3</sub>Sn layer acts as a barrier between the other UBM layers (**28, 30, 32**) and solder bump (**42**), to prevent the spalling of the UBM layer. Furthermore, the Cu<sub>3</sub>Sn layer **34'** is also capable of acting as barrier layer during later process steps when solder bumps **42** are physically and electrically connected to external devices.

Applicant's arguments regarding the process steps of when the barrier layer is formed are not persuasive because a product by process claim is directed to the product per se, no matter how actually made, *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See *In re Fessman*, 180 USPQ 324, 326 (CCPA 1974); *In re Marosi et al.*, 218 USPQ 289, 292 (Fed. Cir. 1983); *In re Brown*, 459 F.2d 531, 535, 173 USPQ 145, 147 (CCPA 1969); *Buono v. Yankee Maid Dress Corp.*, 77 F.2d 274, 279, 26 USPQ 57, 61 (2d. Cir. 1935); and particularly *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985), all of which make it clear that it is the patentability of the final structure of the product "gleaned" from the process steps, which must be determined in a "product by process" claim, and not the patentability of the process. See also MPEP 2113. Moreover, an old

and obvious product produced by a new method is not a patentable product, whether claimed in "product by process" claims or not.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Abul Kalam whose telephone number is 571-272-8346. The examiner can normally be reached on Monday - Friday, 9 AM - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on 571-272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AK



**PHAT X. CAO**  
**PRIMARY EXAMINER**